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MONOGENEAN FAUNA OF DISTRICT SAHARANPUR, U. P., PART-IV

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ABSTRACT

The present communication deals with three known species of the genus *Dactylogyrus* diesing, 1850 from freshwater fishes *Labeo rohita* (Ham.), *Catla* (Ham.) and *Cyprinus carpio* (Linn.). *D. molnari* have been abstracted from the fish *Cyprinus carpio* for the first time in India.

Key Words: *Monogeneans, Dactylogyrus, Dactylogyrus labei, Dactylogyrus Kalyanensis, Dactylogyrus Molnari*

INTRODUCTION

During the course of study of freshwater monogenean fauna of district Saharanpur, I came across two specimen of *Labeo rohita* (Ham.), three specimens of *Catla catla* (Ham.) and one specimen of *Cyprinus carpio* (Linn.) infected with several specimens of *Dactylogyrus labei* Musselius and Gussev, 1973, *Dactylogyrus kalyanensis* Musselius and Gussev, 1973, and *Dactylogyrus molnari* Ergens and Dulma, 1969, respectively. On detailed examination, it was found that the worms at disposal of the authors exhibit several variations besides measurements. Moreover, it also exhibits new type locality for these species. It is, therefore, briefly re-described. The re-description is based on fresh materials collected by authors.

MATERIALS AND METHODS

Fishes, for the present investigation, were collected from ponds and local fish markets of district Saharanpur. They were brought to laboratory and identified. The identification of piscine hosts was made with the help of classical works of McInerney and Gerard (1958), Misra (1959), Srivastava (1980), Nelson (1984) and Day (1989). Monogeneans were collected by freezing technique of Mizelle (1936 and 1938). Worms thus collected, were washed thoroughly, and fixed in hot 70% alcohol or 10% neutral Formaline. Study of chitinous hard parts was made in temporary Glycerin mounts. Permanent mounts were also made after staining in Aceto alum carmine, dehydrating through ascending grades of Alcohol, clearing in Xylene, and mounting in Canada balsam. Camera lucida sketches were made both from temporary and permanent preparations. Besides this, morphological studies were made using Motic Microscope and Image analyzing system. All measurements were taken with the help of stage micrometer and occulometer by method suggested by Mizelle (1936 and 1938), Gussev (1955), Malmberg (1957) and Singh (1959). The measurements were also compared with the measurement taken by Motic image analysis software (2000).

RESULTS

***Dactylogyrus labei* Musselius and Gussev, 1973 (Plate- I, Figure 1-7 and Plate- II, Microphotograph 1-3)**

The body of worm is stout, elongated, measuring 0.24-0.25 mm. Maximum width was recorded in the vaginal region, ranging from 0.045-0.047 mm. Prohaptor and opisthaptor are fairly set off from the body proper through a shallow constriction in the anterior and deep constriction in the posterior regions, respectively. Head is divisible in two lobes. Head is lodged with two pairs of head organs. Each head organ is provided with separate duct, which unite to form a common duct that extends posteriorly and unite to pre-pharyngeal glands. Eyespots are absent. Pharynx is spherical, muscular, measuring 0.016-0.017 mm in diameter. On the antero-lateral sides of the pharynx, four pairs of darkly stained pre-

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pharyngeal glands are present. Intestine simple, bifurcate and crura are united posteriorly at the level of haptoral peduncle.

Male reproductive system consists of a testis, vas deferens, seminal vesicle and male copulatory complex. Testis simple, elongate- oval, inter-caecal, post-equatorial, post-ovarian and measures 0.031-0.032 x 0.015-0.016 mm. From the anterior border of testis, a fine vas deferens arises, extends anteriorly and dilates to form a fusiform seminal vesicle, at the level of cirrus proper, measuring 0.037-0.038 x 0.0091-0.0095 mm. Male copulatory complex consists of elongated tubular cirrus with a swollen bubble like base, measuring 0.036-0.038 mm. The accessory piece of cirrus is one pieced and hook shaped measures 0.0095-0.0098 mm. From the base of cirrus proper a tube arises, extends anteriorly and unites with accessory piece, measures 0.041-0.042 mm.

Female reproductive system consists of an ovary, vagina, vitelline glands, and receptaculum seminis. The ovary is post-equatorial, pre-testicular and oval in the outline and measuring 0.025-0.026 x 0.015-0.016 mm. Vagina is muscular, dextral, funnel shaped, anterior to ovary, measures 0.021-0.022 x 0.004-0.005 mm and communicates to a well developed receptaculum seminis through a small duct. Receptaculum seminis is elongate oval, measures 0.023-0.024 x 0.011-0.012 mm. Single egg is observed in few specimens. It is double walled, pear shaped, measuring 0.021-0.022 x 0.017-0.018 mm. The egg is equipped with a well developed spur at its one end, measuring 0.0011-0.0016 mm in length. Vitelline follicles are co-extensive with intestinal caeca.

The haptor is fairly set off from body proper; discoidal to somewhat pentagonal in shape and measuring 0.0488-0.0495 x 0.062-0.065 mm. Armature of haptor consists of a pair of anchor, transverse bar and marginal hooklets. Each anchor consists of a well developed inner root, slightly less developed outer root, strong shaft and re-curved points. The size of anchors ranges from 0.0281-0.0287 mm. Dorsal transverse bar is strong well developed with a well-defined groove at the middle, measuring 0.0162-0.0165 mm. Marginal hooklets are seven pairs, embedded in the margin of haptor. Each marginal hooklet is with sickle shaped blade, and elongated handle, measuring 0.0085-0.0091 mm.

DISCUSSION

Musselius and Gussev (1973) described a new species viz. *Dactylogyrus labeli* form *Labeo gonius*. They also described new typical form from *Labeo rohita* having difference with type species and placed as *D. labeli*.

Present worm, at the disposal of author is similar with minor differences with *D. labeli* collected from *L. rohita*. Musselius and Gussev (1973) did not describe the soft anatomy of parasite. In present specimen, additional ventral bar is lacking, while egg is present. Musselius and Gussev (1973) reported small point length; it is larger in present specimens. Musselius and Gussev (1973) reported more or less same copulatory complex except the shape of accessory piece. Besides these, differences were also noted in measurements of various parts of the body and appended in the table 1.

***Dactylogyrus kalyanensis* Musselius and Gussev, 1973 (Plate- III, Figure 1-7 and Plate-IV, Microphotograph 1-3)**

The body of worm is stout, elongated, measuring 0.341-0.345 mm. Maximum width was recorded in the vaginal region, ranging from 0.065-0.067 mm. Prohaptor and opisthaptor are fairly set off from the body proper through a shallow constriction in the anterior and deep constriction in the posterior regions, respectively. The head is divisible in two lobes and is lodged with four pairs of head organs and two pairs of eyespots. Each head organ is provided with a separate duct extending posteriorly. Eyespots are very well developed; posterior pair of eyespot is considerably larger than anterior pair on account of presence of large number of melanistic granules. Pharynx is spherical, muscular, measuring 0.028-0.029 mm in diameter. On the postero-lateral sides of the pharynx, four pairs of darkly stained pharyngeal glands are present. Intestine simple, bifurcate and crura are united posteriorly at the level of haptoral peduncle.

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Male reproductive system consists of a testis, vas deferens, seminal vesicle and male copulatory complex. Testis simple, elongate- oval, inter-caecal, post-equatorial, post-ovarian and measures 0.054-0.055 x 0.021-0.023 mm.

Table 1: Showing difference in measurement between various body parts of *D. labei* Musselius and Gussev (1973) and present worm (all measurements are in mm)

Host	D. labei Musselius and Gussev (1973) Labeo gonius and L. calbasu	D. labei Musselius and Gussev (1973) L. L.rohita	Present worm L.rohita
Locality	Lucknow	Kalyani (W.B.)	Sharanpur
Body length	0.40	?	0.24-0.25
Body width	0.08	?	0.045-0.047
Pharynx	?	?	0.016-0.017
Testis	?	?	0.031-0.032 x 0.015-0.016
Seminal vesicle	?	?	0.037-0.038 x 0.0091-0.0095
Cirrus	0.057-0.061	?	0.036-0.038
A. P. of cirrus	0.040-0.052	?	0.0095-0.0098
Vagina	0.0015	?	0.021-0.022 x 0.004-0.005
Ovary	?	?	0.025-0.026 x 0.015-0.016
Egg	?	?	0.021-0.025 x 0.017-0.018
Haptor- Length	?	?	0.0488-0.0495
Haptor Width	?	?	0.062-0.065
Anchor length	0.030-0.035	0.033-0.038	0.0281-0.0287
Inner root	0.008-0.009	0.010-0.013	0.007-0.008
Outer root	0.002-0.003	0.004-0.006	0.005-0.006
Points	0.010	0.013-0.014	0.00041-0.00042
Dorsal transverse bar	0.009-0.013 x 0.018-0.021	0.003-0.004 x 0.022-0.024	0.0162-0.0165
Ventral transverse bar	0.018-0.030 x 0.011-0.015	0.026-0.028 x 0.003	-
Marginal hooklets	0.012-0.017	?	0.0085-0.0091

From the anterior border of testis, a fine vas deferens arises forms loop around left intestinal crura, extends anteriorly and dilates to form a fusiform seminal vesicle, at the level of cirrus proper, measuring 0.048-0.049 x 0.017-0.018 mm. Male copulatory complex consists of curved tubular cirrus with a swollen bubble like base, narrowing to its termination, measuring 0.092-0.096 mm. The accessory piece of cirrus is sickle shaped and initial part is connected by elastic pivot. Length of whole structures is 0.038-0.039 mm; initial part of elastic pivot extends up to the level of the base of cirrus proper.

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Female reproductive system consists of an ovary, vagina, vitelline glands, and receptaculum seminis. The ovary is equatorial, pre-testicular, elongated-oval in the outline and measuring 0.048-0.049 x 0.018-0.019 mm. Vagina is muscular, sinistral, funnel shaped, anterior to ovary, measures 0.011-0.012 mm and communicates to a receptaculum seminis through a small duct. Receptaculum seminis is spherical, measures 0.012-0.013 mm in diameter. Single egg is observed in few specimens. The egg is double walled, spherical in shape, measuring 0.022-0.023 in diameter. Vitelline follicles are co-extensive with intestinal caeca.

The haptor is fairly set off from body proper discoidal in shape and measuring 0.061-0.062 x 0.045-0.046 mm. Armature of haptor consists of a pair of anchor, transverse bar and marginal hooklets. Each anchor consists of a well developed inner root, hardly protruding outer root, strong shaft and re-curved points. The size of anchors ranges from 0.058-0.059 mm. Dorsal transverse bar is strong well developed, dumb-bell in shape, measuring 0.015-0.016 mm. Marginal hooklets are seven pairs, embedded in the margin of haptor. Each marginal hooklet is with sickle shaped blade, heel and elongated handle, measuring 0.0085-0.0110 mm.

Musselius and Gussev (1973) described a new species viz. *Dactylogyrus kalyanensis* form *Catla catla* from fish farm of Kalyani (West Bengal). Present worm, at the disposal of author is similar with minor differences with *D. kalyanensis* collected from *Catla catla*. Musselius and Gussev (1973) did not describe the soft anatomy of parasite. In present specimen, vagina is muscular while Musselius and Gussev (1973) reported chitinous vagina. Musselius and Gussev (1973) reported more or less same copulatory complex except the shape of accessory piece, it is shield shaped in the specimens at the disposal of Musselius and Gussev (1973), but accessory piece is sickle shaped in present specimens. Musselius and Gussev (1973) reported anchors with wings, but in present specimens, anchors are without wings, which could be due to some artifact during fixation. Musselius and Gussev (1973) also failed to observe egg. Besides these morphological variations, differences were also noted in measurements of various parts of the body and appended in the table 2.

Worms at the disposal of the author are significantly smaller than those described by Musselius and Gussev (1973). In my opinion this could be due to the fact that present worms were collected in the summer months when process of embryonic development is fast thus various structures and the worm body remains short as also reported by Singh and Agarwal (1992) for some other monogenean.

***Dactylogyrus molnari* Ergens and Dulma, 1969 (Plate- V, Figure 1-7 and Plate-VI, Microphotograph 1-3)**

The body of worm is stout, elongated, measuring 0.33-0.34 mm. Maximum width was recorded in the ovarian region, and ranging from 0.071-0.075 mm. Prohaptor and opisthaptor are fairly set off from the body proper through a shallow constriction in the anterior and posterior regions. The head is divisible in two lobes and is lodged with five pairs of head organs and two pairs of eyespots. Each head organ is provided with a separate duct extending posteriorly. Eyespots are very well developed; posterior pair of eyespot is considerably larger than anterior pair on account of presence of large number of melanistic granules. Pharynx is spherical, muscular, measuring 0.028-0.029 mm in diameter. On the postero-lateral sides of the pharynx, five pairs of darkly stained pharyngeal glands are present. Intestine simple, bifurcate and crura are united posteriorly at the level of haptoral peduncle.

Male reproductive system consists of a testis, vas deferens, vas efference, seminal vesicle and male copulatory complex. Testis simple, elongate-oval, inter-caecal, post-equatorial, post-ovarian and measures 0.048-0.049 x 0.021-0.022 mm. From the anterior border of testis, a fine vas deferens arises forms loop around left intestinal crura, extends anteriorly and dilates to form a sigmoid seminal vesicle, at the level of cirrus proper, measuring 0.031-0.032 x 0.018-0.019 mm. From the anterior end of seminal vesicle a fine duct, vas efference, arises extend posteriorly and opens at the base of cirrus proper. Male copulatory complex consists of elongated tubular cirrus with a swollen bubble like base, measures 0.021-0.022 mm. The accessory piece of cirrus is dagger shaped measures 0.038-0.039 mm.

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Table 2: Showing difference in measurement between various body parts of *D. kalyanensis* Musselius and Gussev (1973) and present worm (all measurements are in mm)

Host	<i>D. kalyanensis</i> Musselius and Gussev (1973) <i>Catla catla</i>	Present worm <i>Catla catla</i>
Locality	Kalyani (W.B.)	Sharanpur (U.P.)
Body length	0.90	0.341-0.345
Body width	0.12	0.065-0.068
Pharynx	?	0.028-0.029 x 0.021-0.022
Testis	?	0.054-0.055 x 0.021-0.023
Seminal vesicle	?	0.048-0.049 x 0.017-0.018
Cirrus	0.42-0.043	0.092-0.096
A. P. of cirrus	0.060-0.10	0.038-0.039
Vagina	0.42 (chitinoid)	0.011-0.012 (muscular)
Ovary	?	0.048-0.049 x 0.018-0.019
Egg	?	0.022-0.023
Haptor length	?	0.061-0.062
Haptor width	?	0.045-0.046
Anchor length	0.063-0.073	0.058-0.059
Inner root	0.026-0.029	0.025-0.026
Outer root	0.002	0.002
Points	0.026-0.029	0.015-0.016
Dorsal transverse bar	0.004-0.005 x 0.023-0.025	0.015-0.016
Marginal hooklets	0.013-0.018	0.008-0.011

Female reproductive system consists of an ovary, vagina, vitelline glands, and receptaculum seminis. The ovary is equatorial, pre-testicular and oval in the outline and measuring 0.035-0.036 x 0.028-0.029 mm. Vagina is muscular, sinistral, funnel shaped, anterior to ovary, measures 0.012-0.013 mm and communicates to a receptaculum seminis through a small duct. Receptaculum seminis is oval in outline, measures 0.015-0.016 x 0.011-0.012 mm. Single egg is observed in few specimens. The egg is double walled, oval in shape measuring 0.038-0.039 x 0.022-0.023 mm. Vitelline follicles are co-extensive with intestinal caeca.

The haptor is fairly set off from body proper discoidal in shape and measuring 0.071-0.072 x 0.061-0.062 mm. Armature of haptor consists of a pair of anchor, transverse bar and marginal hooklets. Each anchor consists of a well developed inner root, comparatively less developed outer root, strong shaft and re-curved points. The size of anchors ranges from 0.058-0.059 mm. Each anchor is provided with sleeve sclerite in shaft region. Dorsal transverse bar is strong well developed, having protrusion in each terminal side, measuring 0.018-0.019 mm. Marginal hooklets are seven pairs, embedded in the margin of haptor. Each marginal hooklet is with sickle shaped blade, heel, elongated handle and opposable piece, measuring 0.021-0.022 mm. On the basis of morphological characteristics the parasite is identified as *D. molnari*, a species described by Ergens and Dulma (1969). To the best of my knowledge, *Dactylogyrus* species, which have been abstracted out from Indian water, are appended in table 3.

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Table 3: Showing different Dactylogyrus Species abstracted from India

Species	Author	Host
<i>D. anchoracanthus</i>	Kulkarni, 1970	Cirrhinus, Chela
<i>D. angularis</i>	Gussev, 1973	Barbus, Puntius
<i>D. bacailai</i>	Agrawal and Singh, 1982	Oxygaster
<i>D. barbi</i>	Gussev, 1973	Barbus
<i>D. batae</i>	Jain, 1959	Labeo
<i>D. bati</i>	Tripathi, 1959	Labeo
<i>D. boli</i>	Tripathi, 1959	Raimas
<i>D. brevicardus</i>	Gussev, 1973	Barbus
<i>D. brevifucatus</i>	Kulkarni, 1970	Cirrhinus
<i>D. brevitignus</i>	Gussev, 1973	Barbus, Puntius
<i>D. brevitubus</i>	Gussev, 1973	Labeo
<i>D. bucinus</i>	Gussev, 1973	Barbus
<i>D. calbasi</i>	(Jain, 1957; Gussev, 1973)	Labeo
<i>D. catlaius</i>	Thapar, 1948	Catla, Labeo
<i>D. cauveryi</i>	Tripathi, 1959	Barbus, Puntius
<i>D. chagunionis</i>	Tripathi, 1959	Barbus
<i>D. chauhani</i>	Gussev and Musselius, 1975	Cirrhinus
<i>D. chitravansii</i>	Gussev, 1973	Labeo
<i>D. circumphallus</i>	Venkatanarsaiah, 1981	Chela
<i>D. cirrhini</i>	Jain, 1960	Cirrhinus
<i>D. cotius</i>	(Jain, 1957; Gussev, 1973)	Rohiee
<i>D. crucitrabus</i>	Gussev, 1973	Cirrhinus
<i>D. dubii</i>	Gussev, 1973	Barbus
<i>D. fotedari</i>	Gussev, 1973	Labeo
<i>D. glossogobi</i>	Jain, 1960	Glossogobius
<i>D. hyderabadensis</i>	Kulkarni, 1972	Barbus
<i>D. indicus</i>	Jain, 1957	Barbus, Puntius
<i>D. kalyanensis</i>	Musselius and Gussev, 1973	Catla
<i>D. kontii</i>	Tripathi, 1959	Labeo
<i>D. labei</i>	Musselius and Gussev, 1973	Labeo

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<i>D. lali</i>	Gussev, 1973	Glossogobius
<i>D. lanka</i>	Tripathi, 1975	Barbus, Puntius
<i>D. lohanie</i>	Gussev, 1973	Labeo
<i>D. longiacus</i>	Gussev, 1973	Barbus, Puntius
<i>D. longicirrus</i> (Transferred to Dactylogyroides) Gussev, 1978	Tripathi, 1977	Tor, Puntius, Schizothorax, Barbus
<i>D. macrogaster</i>	Venkatanarsaiah, 1981	Clarias
<i>D. magnicordus</i>	Gussev, 1973	Barbus
<i>D. manairensis</i>	Venkatanarsaiah, 1981	Macrogathus
<i>D. mrigali</i>	Gussev, 1973	Cirrhinus
<i>D. orientalius</i>	Jain, 1959	Barbus
<i>D. parvianchoris</i>	Gussev, 1973	Chela
<i>D. pendunculatus</i>	Kulkarni, 1970	Rasbora
<i>D. pharyngocephalus</i>	Kulkarni, 1970	Glossogobius
<i>D. ritius</i>	Jain, 1961	Rita
<i>D. sarani</i>	Triphati, 1959	Barbus, Puntius
<i>D. seenghali</i>	(Jain, 1962; Kumar and Singh, 2004)	Mystus, Wallago
<i>D. soni</i>	Gussev, 1973	Glossogobius
<i>D. speciosus</i>	Gussev, 1973	Labeo
<i>D. sphyrnoides</i>	Gussev, 1973	Barbus
<i>D. spinitubes</i>	Gussev, 1973	Catla
<i>D. subtilis</i>	Gussev, 1973	Barbus, Puntius
<i>D. tetradiatus</i>	(Kulkarni, 1970; Gussev, 1978)	Clupea
<i>D. thapari</i>	Agrawal, 1980	Labeo
<i>D. tori</i>	Gussev, 1973	Barbus
<i>D. varicorhinoides</i>	Gussev, 1973	Barbus
<i>D. vicinus</i>	Gussev, 1973	Labeo
<i>D. yogendrai</i>	Gussev and Musselius, 1973	Cirrhinus, Labeo

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Molnari have been abstracted from the fish *Cyprinus carpio* for the first time in India. This might be transplanted to India with transplantation of *Cyprinus carpio*. Earlier, this parasite has been reported from *Cyprinus carpio haematopterus* by Ergens and Dulma (1969) from Mangolia (China) and from Hungary by Molnar (1982).

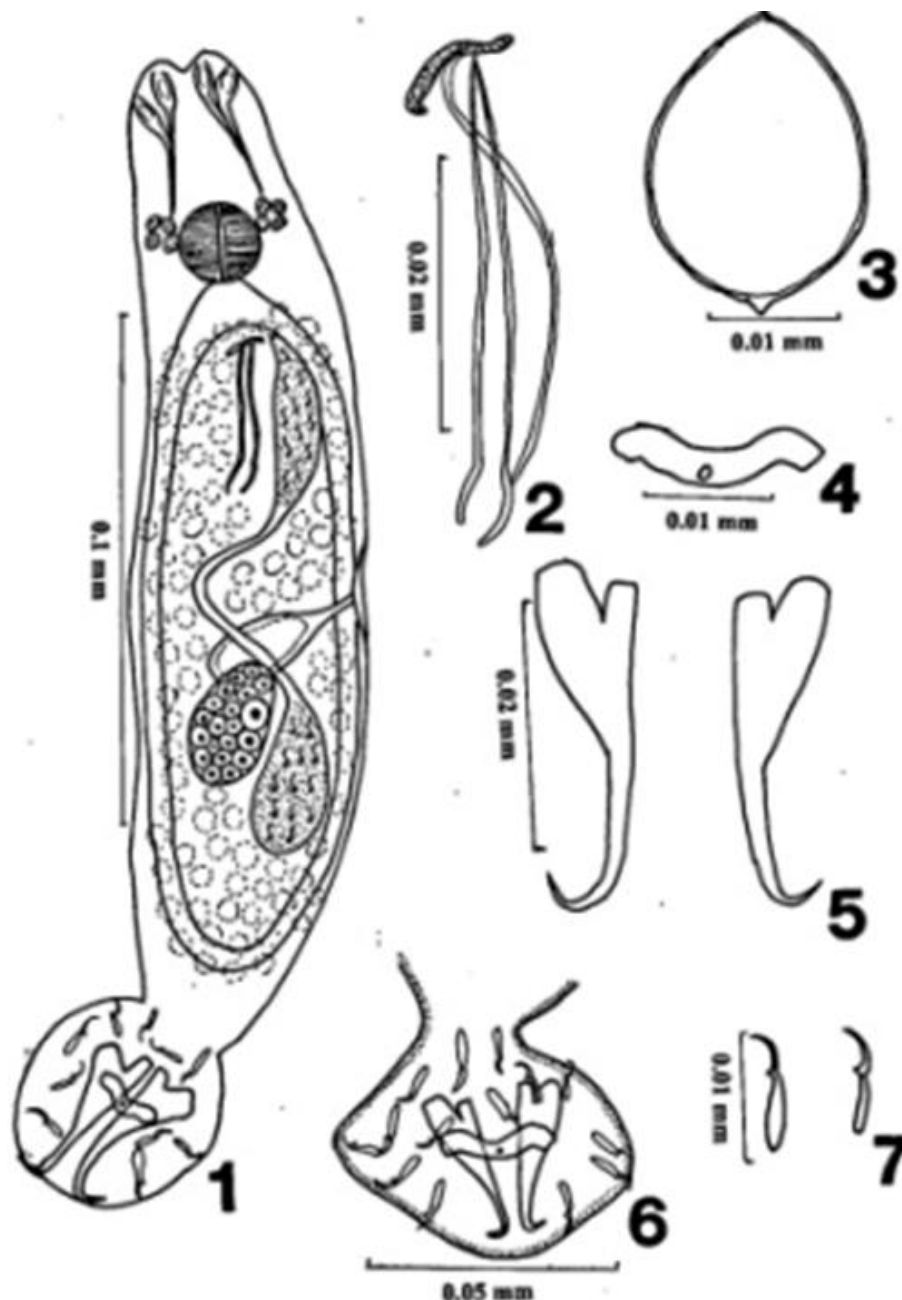


PLATE I: *Dactylogyrus laevis* Musselius and Gussev, 1973 Figure 1. Whole mount, Figure 2. Male copulatory complex, Figure 3. Egg, Figure 4. Dorsal transverse bar, Figure 5. Anchors, Figure 6. Haptor, Figure 7. Marginal hooklets

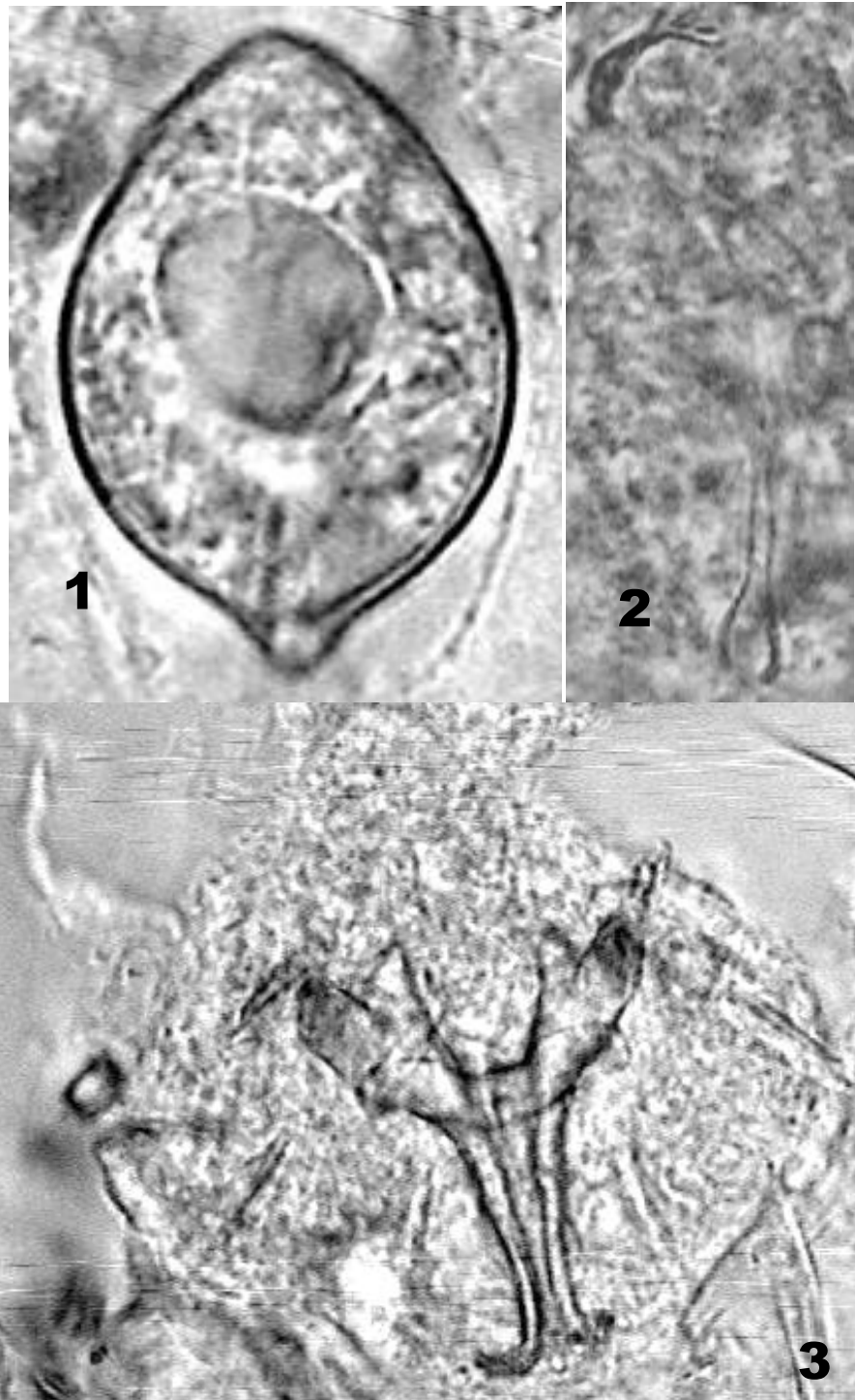


PLATE II: *Dactylogyrus labei* Musselius and Gussev, 1973 Microphotograph 1. Egg, Microphotograph 2. Male copulatory complex, Microphotograph 3. Haptor

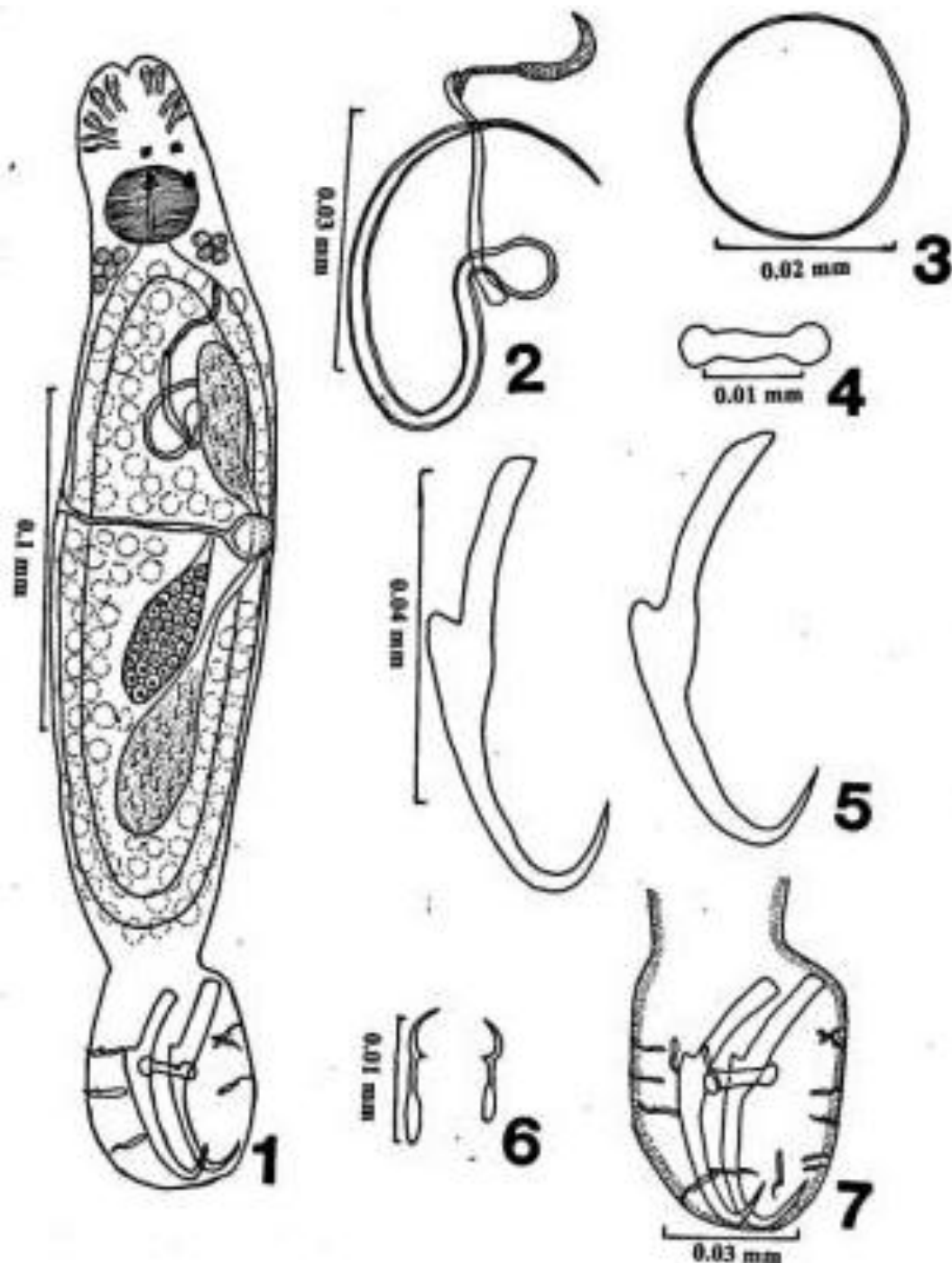


PLATE III: *Dactylogyrus kalyanensis* Musselius and Gussev, 1973 Figure 1. Whole mount, Figure 2. Male copulatory complex, Figure 3. Egg, Figure 4. Dorsal transverse bar, Figure 5. Anchors, Figure 6. Marginal hooklets, Figure 7. Haptor

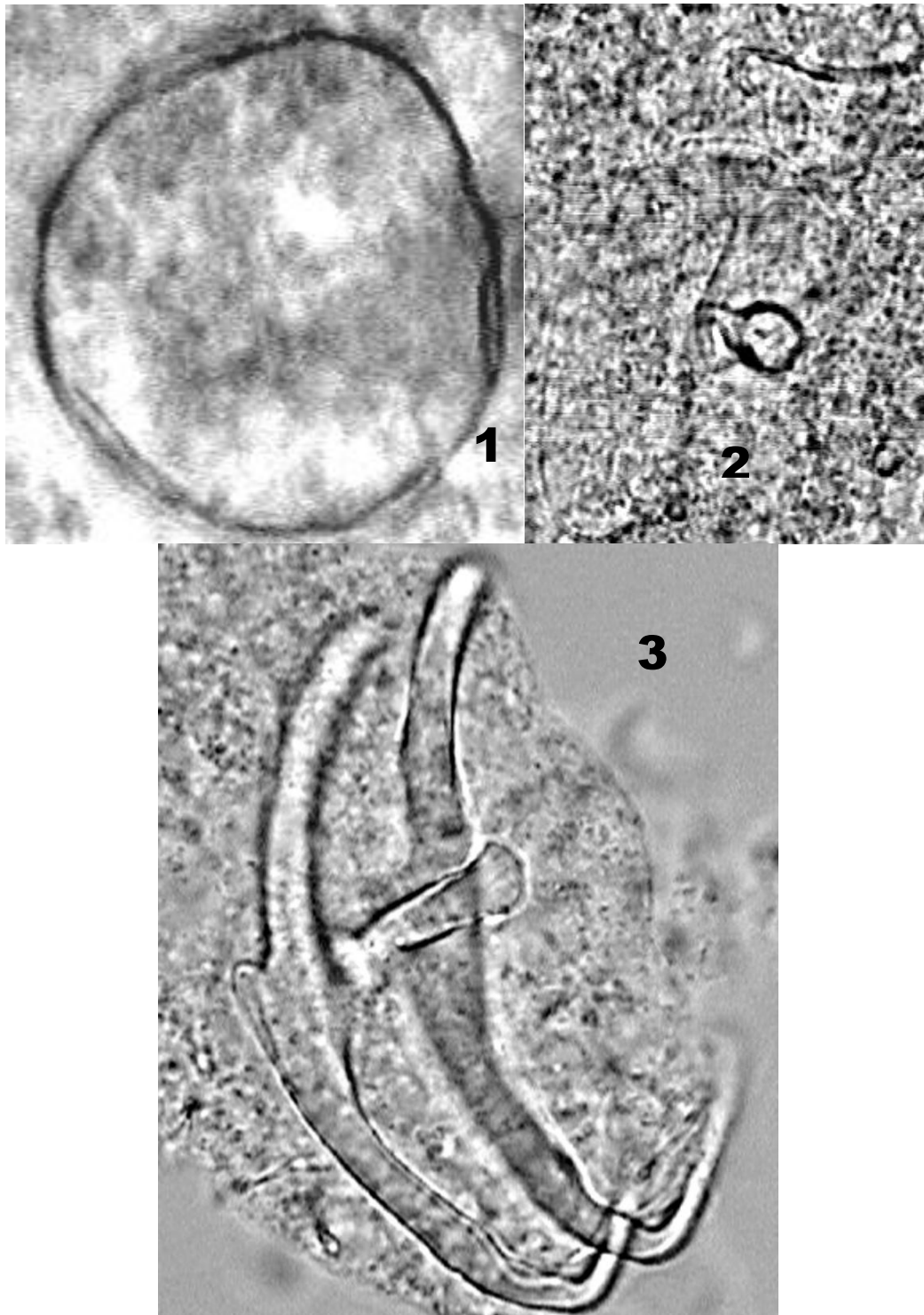


PLATE IV: *Dactylogyrus kalyanensis* Musselius and Gussev, 1973 Microphotograph 1. Egg, Microphotograph 2. Male copulatory complex, Microphotograph 3. Haptor

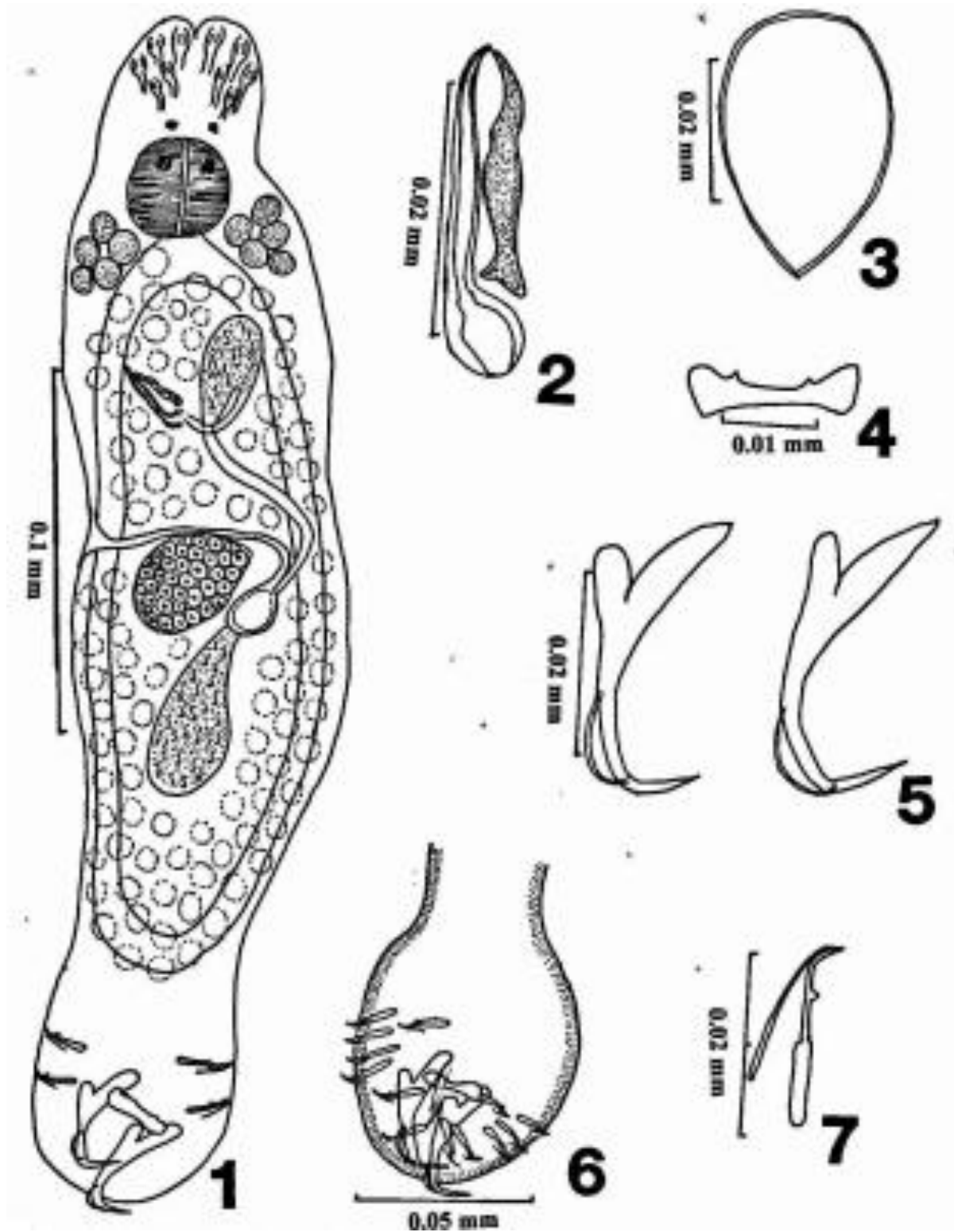


PLATE V: *Dactylogyrus molnari* Ergens and Dulma, 1969 Figure 1. Whole mount, Figure 2. Male copulatory complex, Figure 3. Egg, Figure 4. Dorsal transverse bar, Figure 5. Anchors, Figure 6. Haptor, Figure 7. Marginal hooklets

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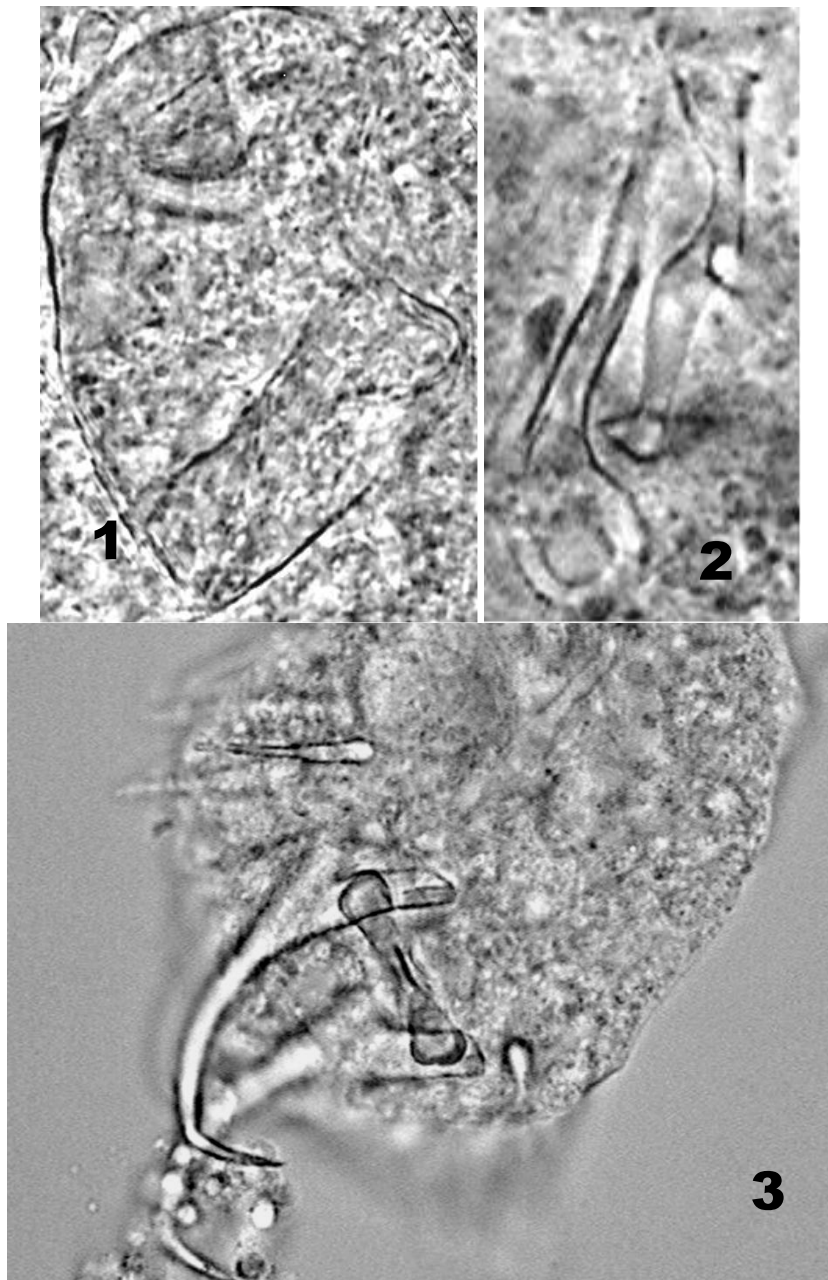


PLATE VI: *Dactylogyrus molnari* Ergens and Dulma, 1969 Microphotograph 1. Egg, Microphotograph 2. Male copulatory complex, Microphotograph 3. Haptor

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